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The Cephaleuros Disease . . . Of Citrus

R. F. Suit and E. P. DuCharme,
Plant Pathologists, Citrus Experiment Station, Lake Alfred, Florida

In 1945 four groves were examined to determine the nature of an apparently new disease of limes and lemons. Three of the groves were in Polk county and the other was in Manatee county. Upon examination it was found that the disease was an algal spot caused by the alga Cephaleuros virescene Kunze (C. mycoidea Karst). This disease was known to occur on citrus in Florida as early as 1915. Since that time the disease has been observed at irregular intervals and was considered to be unimportant. However in 1946 the disease was found in several other locations. Since the disease is causing damage to the trees (Fig. 1) it appears desirable to acquaint the citrus growers with this disease and to suggest possible methods for its control.

Distribution

The disease is known to occur principally in the southern half of the state of Florida. Although it occurs occasionally in the central part of the state the disease is most prevalent along the east and west coasts and the extreme southern part of the state where conditions are more generally favorable for the growth of the parasite. This alga has also been reported as occurring in the West Indies, South America, East Indies, India and Africa.

In Florida Cephaleuros virescene has been reported to occur on approximately fifty species of plants, and some of the more important hosts besides citrus, are guava and avocado, although on the latter the disease is not of economic importance. During June and July of 1946 the disease was found on the following kinds and varieties of citrus:

Lime: Tahiti, Key.
Lemon: Meyer, Ponderosa.
Grapefruit: Thompson Pink, Royal, Foster Pink, Marsh.
Orange: Pineapple, Navel, Hamlin, Blood, Temple, Jaffa, Orlando, Valencia.
Tangerine: Dancy.
Tangelo: Mineola.
Kumquat and Calamondin.

Symptoms And Nature Of The Disease

Usually the disease is not noticed until the red fruiting stage of the alga is present on the bark of the twigs and branches. The infected areas may be small spots from one eighth of an inch to one inch in diameter or the spots may have coalesced to cover the entire surface of a branch for a few inches up to several feet. The extent of the diseased area is an indication of the length of time that the twig or branch has been infected. For the greater part of the year the lesions are covered with a thin greenish-grey velvety layer of algae. At certain times of the year the velvety growth assumes a brick red color due to the presence of the fruiting structures of the alga.

On the leaves, round spots occur. These are more noticeable when the alga is fruiting at which time the spots are reddish brown

(Continued on Page 10)

The Citrus Industry
EXCLUSIVE SPECIALIZED CITRUS PUBLICATION
Issued Monthly
Representative of every interest
Representing no special interest

Publication office at Bartow, Florida. Entered as second class matter February 16, 1920, at the post office at Tampa, Florida, under the act of March 3, 1879. Entered as second class matter June 19, 1933, at the post office at Bartow, Florida, under act of March 3, 1879.

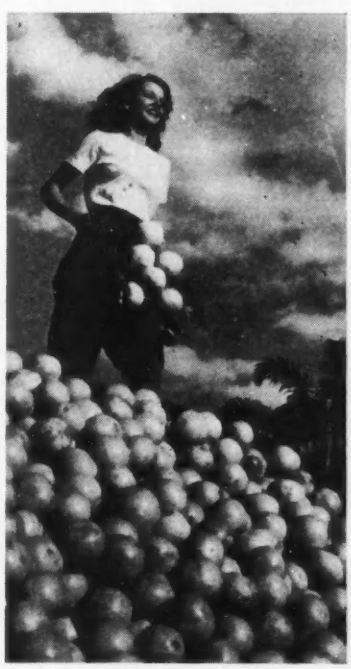
Florida Citrus Commission

Sponsors Pictorial Publicity Program . . . . . .

"Pictures are the thing we need" was the decision of the Citrus Commission after surveying plans for supplementing the advertising program. The pictures they had in mind would, of course, show golden oranges, gleaming grapefruit and vivid tangerines. They would be pictures calculated to make mouths all over the country water for a taste of the delectable fruit. They would be pictures too, which editors would delight to publish in newspapers and magazines.

They agreed that the very man who could best do all this was Dick Pope of Winter Haven, well known for many years as one of Florida's foremost pictorial publicists. He knows the citrus district, is a sincere believer in Florida and is not only a fine photographer but has all the equipment, costumes and personnel for producing the varied types of pictures desired as well as being in close contact with newspaper and magazine editors throughout the country who are familar with his work.

Through his organization a great number of pictures dealing with oranges, grapefruit and tangerines have been sent through the national syndicates to thousands of newspapers in the United States. In the titles and captions the words, Florida and either oranges, grapefruit or tangerines are given a prominent place, leaving the reader in no doubt as to the pictures' source.



PAT SMITH of Lakeland poses in a dramatic picture with grapefruit that caused one of the leading calendar companies to ask for it to be used nationally.

The usual drawback to this program is that most pictures made by publicity men in Florida show girls in bathing suits doing things and it does look a little out of reason for girls in bathing suits to be picking oranges and it is certainly to the credit of the Commission and to Dick Pope that not a single picture of a girl in a bathing suit has been released so far. This has, without doubt, kept the entire program on a high level and has done away with the old theory that girls had to be in bathing suits to be glamorous.

Clippings show that these pictures have been well received by the newspapers. Many of the shots use lovely girls eating oranges, picking oranges or just looking pretty among the fruit and flowers. Another type that has gone over well has been what are known as "KID" pictures, attractive little girls or freckled faced little boys accompanied by citrus of some sort. One most attractive shot of Lakeland's Pat Smith standing on a huge pile of grapefruit was so well liked that it will be used next year in color as a calendar picture.

A great number of color pic-

tures have been made. Some as colored slides will be sent out as a part of illustrated lectures for use by organizations in the north. These will show the groves, with closeups of the fruit and flowers as well as scenery through the citrus section of the state.

So far one cover picture has been used by a magazine with national circulation, PARADE, which goes each Sunday to three and a half million readers. In brilliant color the Florida oranges form a background for the lovely smile of Nance Stilley.

Writers and editors over the nation are now securing citrus pictures both of the glamorous type and the actual operation in the groves and packing houses through the photographic library being produced under this program. Actually a complete new photographic system is being installed, one that should make it easy for Donald Butts, Advertising Manager of the Citrus Commission, to have on hand the types of pictures requested by a hundred different outlets such as schools, trade journals, magazine writers, etc., who are always seeking authentic photographs for publication over the nation.

All in all the pictorial publicity campaign is really going over and can be counted on, under the management of Mr. Pope, to carry the message of Florida's juicy-heavy fruit to potential customers all over the country.

This type of orange grove picture is very popular with editors. It shows the mother and daughter picking oranges in a happy mood.

Notes Of The Trade . . .

BACK ON THE JOB

After a tour of four years with the Navy Department in the Pacific, Pat J. Blake has rejoined Bruce's Juices, Inc., again. Formerly a fruit buyer for the company, he has returned as office manager and sales representative.

NEW ASSISTANT

F. Ray Linda has joined St. Regis Paper Company's New York office as assistant to Carl H. Hartman, director of technical development and vice president of St. Regis Sales Corporation, the St. Regis sales subsidiary. Mr. Linda is widely known in the paper industry through many years of sales engineering and sales development work, particularly in connection with bag-filling and closing equipment, and development of variations in bag construction and closures.

INSTALLS NEW EQUIPMENT

The Tacoma plant of E. I. du Pont de Nemours & Company has recently installed equipment for the manufacture of a complete line of agricultural dusts. Additional expansion will be made as research developments arise that are valuable to Pacific Northwest agriculture, the company said.

PRE-PACKAGING IS POPULAR

Widespread interest is being manifested in the produce industry in pre-packaging of fresh fruits and vegetables in consumer-sized packages. Interest in this matter is by no means limited to growers and shippers. Many wholesalers and jobbers as well as a substantial number of retailers are taking an active interest in the matter, and are speculating as to how much of a factor pre-packaging is go-to be in the produce trade. Pre-packaging as a method of marketing fruits and vegetables is not new. For several decades specialized wholesalers have been pre-packaging tomatoes and celery, and many growers and shippers have successfully packaged potatoes, onions, and oranges in consumer-sized lots for several years. The newer aspects of pre-packaging include the extensive use of cellulose

(Continued on Page 21)

Citrus Research On The East Coast Of Florida

T. W. YOUNG
Associate Horticulturist
At Meeting of The Florida State Horticultural Society

Early in 1942 the Citrus Experiment Station entered upon a research program on the East Coast designed to investigate problems in citrus culture peculiar to that area. The first step in this program was a rather thorough survey of the grove conditions and existing cultural practices on the East Coast so as to more intelligently set up any research projects. During the course of this survey a rooting study of citrus growing of the principal and representative soil types was made to gather information on the variations in depth and extent of rooting under various conditions. It was found that the principal root zone was in the surface 12 inches with few roots below 18 inches. Little rooting across the middles of bedded groves, except those with very shallow furrows, was found. A survey was also made of the chemical composition of the principal soil types planted to citrus in an attempt to arrive at their relative fertility and determine, insofar as possible, what recommendations probably should be made in a general way concerning fertilization and other cultural practices. As a rule it was found that the coastal soils were relatively high in exchange capacity, exchangeable bases, and nitrogen, but averaged somewhat lower in available phosphorus than the Ridge citrus soils. Because of calcareous material in the root zone or so closely underlying it as to have an influence on its composition, the ratio of exchangeable bases was frequently unfavorably high.

A rather satisfactory spray program for coastal areas had been developed previously primarily through some extensive investigations conducted in the Vero Beach section by Mr. W. L. Thompson, Entomologist, and Dr. George Duehle, Pathologist of the Citrus Station. The spray recommendations for insect and disease control contained in Schedule A of the Better Fruit Programs was based largely on the results of these investigations.

With the exception of this spray program a great diversity of opinions was found among the growers as to what constituted the best, or even satisfactory cultural practices. It soon became evident that many problems needed attention and that the same problems were not necessarily of paramount importance in each section. Work could not be initiated on all problems at the same time. The ones selected for immediate attention were those which gave the most promise of yielding information which would in turn yield the greatest net cash returns to the industry in the area as a whole.

Throughout the entire area, and especially from St. Lucie County north, moisture conditions in most groves had become increasingly critical as the trees increased in size. Of the factors concerned in the production of citrus, which can be at least partially controlled by the grower, none are of greater importance than the maintenance of proper soil moisture. Consequently water relation investigations were started in the spring of 1942, with Indian River County being selected as the center of the work because of its variety of soils, which were more or less representative of the principal soil types planted to citrus elsewhere in the area.

Most of the soils planted to citrus in the Davie section and some of those in citrus around Lake Okeechobee are unique because of their high organic matter content. Nutritional problems on these organic soils are widely different in many respects from those on the more mineral type soils on which a majority of citrus in this state is planted, and towards which most nutritional research has been directed. For several years the Everglades Experiment Station had conducted work with the 3 major elements on citrus on these organic soils. However, additional work with these as well as the minor elements was urgently needed. Since the Everglades Station was not prepared to handle additional work on citrus, the Citrus Station established a series of fertilizer and nutritional spray plots near Davie after having first made a thorough chemical examination of the soil.

Other research projects have been established and conducted in the order of their apparent need when facilities and time permitted. These have for the most part been given secondary attention in order to expedite work on those problems of major importance and may or may not be mentioned later in this paper.

Water Relation Investigations

During 1942 an investigation was made in the field near Vero Beach on the effiiciency of the "furrow" type irrigation commonly practiced in bedded groves in the artesian areas of the East Coast. From this there were strong indications that little water moved into the root zone as a result of the average irrigation except in sandy soils. A complete report was given on this before this Society at the 1943 meeting (7) and will not be gone into in detail again. It is sufficient to say that it was not unusual to find trees on the heavier soils wilting during irrigation or just after having been irrigated.

The next step in this work was to set up a series of 12 plots on soils which represented the range in citrus soil texture and grove conditions of the area. The purpose of these plots was to make a thorough survey of the moisture conditions that actually existed in the groves over a period of relatively normal weather as well as wet and dry weather when draniage and irrigation were involved. Rain gauges were maintained on each plot and irrigation records secured in order to evaluate the influence of both rain and irrigation on soil moisture. Periodic sampling and m o i s t u r e. determinations were made by the oven-dry method. This method was a more satisfactory measure of the efficiency of an irrigation than the one used previously because increases in moisture due to both gravitational and capillary move-

ment of water were measured. In the earlier work only water moving into the soil by gravity was actually measured.

In conjunction with this field work moisture tension studies were made and soil moisture retention curves plotted for each soil to determine its "available moisture holding capacity" and "air capacity". Available moisture is that portion of soil moisture between the zone in whicn drainage from the soil has practically ceased (actual field capacity) after having been saturated and the zone in which plants permanently wilt in a saturated atmosphere unless water is added to the soil (wilting point). The available moisture holding capacity is the amount of available moisture a particular soil will retain, once it has been supplied through rain or irrigation, and is usually expressed as the percentage by volume of the soil. The air capacity of a soil is the percent by volume of air in a soil when soil moisture is at the field capacity for that particular soil.

The possible practical applications of such information are several. In order to irrigate most effectively and economically the actual field capacity and the wilting point of the soil in question should be known and the soil moisture maintained between these two values. Irrigation should be done before the wilting point is reached and only enough water applied to bring the moisture of the entire body of soil in the root zone to approximately the actual field capacity. Water supplied in excess of this drains away rapidly and benefits the plants little, and excessive leaching of nutrients results. The effects of soil moisture at or below the wilting point are obvious and well known. An idea of the relative abilities of various soils to retain moisture, once it is supplied, can be obtained by comparing their available moisture holding capacties. In order that there will be no retardation of root growth or functioning, and for soil sanitation reasons, it is essential that a portion of the soil pore space be filled with air. Perhaps roughly an ideal condition would be that in which about half the total pore space was occupied by air, the other half, of course, being occupied by water. There is little question, however, but what most plants thrive in most soils with rather wide variations in the air: water ratio. An air capacity of at least 10 per cent by volume has been considered in a general way to indicate the minimum in adequate drainage.

With the water table between 4 and 5 feet below the surface (average normal weather water table for the Vero Beach section) the available moisture holding capacity of the surface 6" of soil from these plots ranged from 4.3% by volume (0.26") for a Leon fine sand to 9.4% (0.56") for a Manatee fine sandy clay loan. The 6-12" layer of these same soils had a value of 3.5 % (0.21") and 10.8% (0.65") respectively, and the 12-8" layer 2.7% (0.16") and 11.5% (0.69"). If the water table was dropped a couple of feet (average drought water table for the section) the available moisture holding capacities of their soils were reducted on an average of 21% for the Leon soil and 13% for the Manatee soil.

Interpreting these data on the basis of the amount of avtilable moisture that could be held in the surface 18" after it had come to equilibrium with the forces tending to drain it, with the normal weather water table we find the light Leon soil could retain a total of 0.63" or approximately 17,000 gallons of water per acre 18". It is roughly estimated this would maintain an average mature grove with a medium coverage crop from 1 to 2 weeks before wilting occurred. If drought had lowered the water table a couple of feet the amount that could be retained might be sufficient for only 5 to 11 days. If there was considerable rooting below the 18" level or cross rooting into the furrows the period would likely be proportionately longer. In the much heavier Manatee soil a total of 1.9" or 51,000 gallons of water could be retained in the surface 18" over the normal weather water table. Estimated on the same basis as for the Leon soil, this would satisfactorily support the trees for about 3 to 6 weeks, depending upon depth and spread of rooting. Lowering the water table 2 feet might reduce this to something between 2-1/2 to 5 weeks.

The air capacity at the higher water table ranged from about 16% in a marl soil to about 38% in a fine sandy loam. These values increased slightly with the lowering of the water table. In either case drainage would be considered adequate. Further analyses of these data from the soil moisture retention curves indicated, at least theoretically, a water table at 3 feet would be approximately the maximum height to which it could be raised and yet insure ample drainage in the lower portion of the 18" root zone in the soils examined.

Similar moisture tension studies made on organic soils from the Davie area showed them to have, on the average, an available moisture holding capacity of approximately twice that of the soils from the Vero Beach section. The moisture holding capacity and the air capacity both increased with an increase in organic matter, although not in proportion and at lower and varying rates. The air capacity of these organic soils was found to be relatively high even with a water table at 3 feet. For the sake of further comparison, the light sandy soils of the Ridge were found to have a slightly lower available moisture holding capacity than the lightest soils tested from the East Coast. However, because of more extensive rooting generally in the Ridge this capacity is estimated to be sufficient for about 2 weeks for the average mature grove The sands of the Ridge also have a relatively high air capacity.

It should be understood that a high or a low available moisture holding capacity is not synonimous with high or low actual soil moisture. The available moisture holding capacity is only a measure of the soil's ability to retain moisture, against the forces tending to drain it, once it has been supplied through rainfall or irrigation. It is obvious that in order to benefit by a high available moisture holding capacity, over a low one, that more water would have to be supplied. In fact, many soils with high available moisture capacities also have high wilting points. With soil moisture below the wilting point a given amount of water added to such soils might not result in as much available moisture as on another soil with a lower available moisture capacity, equally below the wilting point. but having a lower wilting point. The actual air capacity of any soil is inversely proportional to its actual water content; i. e., the greater the water the less the air.

The field studies gave a good broad general picture of the relation between rainfall and/or irrigation and the moisture present in these soils under field conditions. Conclusive evidence was also ob-

tained that the movement of water into and through these soils, particularly that portion moving primarily by capillarity, was slow except in sands. Irrigation, as generally practiced by flooding the tree row middles, usually resulted in an increase in soil moisture to only a fraction of the field capacity. Only occasionally was it found to have reached field capacity and then usually in the deeper layers of soil below the level to which water had been raised in the middles. Not infrequently the moisture remained below the wilting point in heavy soils after irrigation, even in the 12-18" soil layer. In one grove observed, when the moisture was below the wilting point in the surface 6", but above in the deeper layers, the trees did not recover from wilting overnight. This occurred during nights of high humidity as well as those with low humidity, as evidenced by dew or its absence. From these observations it appeared that the trees were restricted in their rooting primarily to the surface layer. There was not sufficient rooting in the deeper layers to prevent wilting, even in a saturated atmosphere. Reasonably well distributed rainfall, if only in moderate amounts, was much more effective in maintaning favorable soil moisture than the best regulated irrigation by flooding observed in this study.

The significance of these findings can be briefly summarized. If flooding irrigation is to be practiced effectively the water must be brought high on the beds so as to practically cover the surface. Then gravitational forces as well as capillary forces act to distribute water through the soil. The period of flooding should not be prolonged, 24 hours should be about the maximum, and certainly not longer than 36 hours. Longer periods may result in root damage in the deeper layers of soil, especially in light soils because of the more rapid expulsion of air from light than from heavy soils. This would usually mean that the water would have to be confined to fewer tree rows to allow getting sufficient water on and off a given area quickly. In some cases more wells would be advisable. The alternative is irrigation by some sort of sprinkler system. A few such systems are now in operation and apparently paying good dividends. We have recently set up an irrigation experiment in coopera-

(Continued on page 11)

THE CEPHALEUROS DISEASE OF CITRUS

(Continued from page 3)

or rust colored. The alga also has been reported as causing a blemish on the fruit. The lesions on the fruit were dark brown to almost black in color, slightly raised with irregular margins. The spots were small being from one sixteenth to one eighth of an inch in diameter.

The information obtained during 1945 and 1946 indicated that the infection of the bark by the alga was causing considerable injury to the trees in some cases. No evidence was found to indicate that either the bark on the twigs of the current flush of growth or the bark on the trunks or larger limbs was infected. As a result of the alga penetrating the tissues immediately below the epidermis of the bark, the bark becomes thickened and the twigs or branches become enlarged at the places attacked. The attacked bark eventually becomes cracked and scaly and the twigs are stunted and the foliage is sparse. If new bark cannot form rapidly enough to make up for the loss caused by the alga, death of the diseased twigs will result. However if the new bark is formed in sufficient amounts the outer diseased bark will crack, become scaly and slough off (Figs. 2 and 3). When the twigs or branches are in this condition their appearance may be confused with that of Scaly Bark, which is an entirely different disease. Under conditions favorable for the development of the disease, particularly on limes and lemons, the death of numerous twigs and branches up to two inches in diameter has been observed (Fig. 1). In some cases the branches may be only weakened, The attack by the alga results in a poor tree and a reduced yield of fruit.

Cephaleuros virescens which causes this disease is one of the few forms of parasitic algae. During the summer rainy season when the alga shows the brick red color, spores are being produced on the tips of the fruiting structures (Fig. (4.). These spores are carried by the rain and wind to healthy twigs and branches where they lodge in the cracks in the bark. Here the spores germinate and the alga starts to grow and invades the outer layers of the bark, at the same time producing an aerial growth which is greenish in color. The aerial growth continues to extend whenever the weather conditions

(Continued on pake 15)

Figure 1. Tahiti lime tree showing dead twigs and branches as a result of infection by Cephaleuros virescens. Auburndale, Florida, July, 1946.

Figure 2. Scaly bark condition of small branches of tangerine induced by Cephaleuros virescens. Bradenton, Florida, June, 1946.

Figure 3. Scaly bark condition of small branches of Valencia orange induced by Cephaleuros virescens. Sarasota, Florida, June, 1946.

CITRUS RESEARCH ON THE EAST COAST OF FLORIDA

(Continued from page 9)

tion with Mr. T. A. Peebles and Mr. J. M. Hopewood, who are furnishing the equipment, labor and grove, at Vero Beach.. Within due time this experiment should yield some accurate information on the net returns from sprinkler irrigation as compared to both no irrigation and flood irrigation.

Within the past year or so there has been considerable agitation in the Vero Beach Drainage District to conserve soil moisture by raising and controlling the water table in the district with a series of locks or gates in the drainage canals. The Citrus Experiment Station has been approached for advice on this somewhat highly controversial subject. Little fundamental data were available concerning the level at which a water table should be held for optimum results with citrus. The first step in securing such data was the installation of a series of 20 water table wells in a grove in the drainage district. These were installed through the cooperation of Mr. E. E. Carter, Indian River County Engineer. Periodic measurements are made to trace the fluctuations of the water table under present conditions. Later it is proposed to raise and control the water table in a portion of the grove to compare the response of trees in this portion with those in the uncontrolled portion of grove. Similar water table well installations will be made throughout the district as rapidly as labor permits.

Incidental to securing rainfall records for the moisture study plots something as to the magnitude of rainfall variation within a limited area was obtained. The 12 plots were distributed so as to encompass an area of approximately 35 square miles. Rainfall on individual plots from November 1, 1943 to November 16, 1944 ranged from 52.84" to 64.92", a difference of 12.08". The plot receiving the maximum and that receiving the minimum were about 5 miles apart. Approximately 10 to 15 inches of the rainfall for the period occurred during a 5 day period accompanying the hurricane of October 16, 1944.

To trace any tendency towards an increased saltiness in the artesian irrigation waters on the East Coast about 130 index wells, distributed from south of Ft. Pierce to Oak Hill, are analysed annually for salt. This work has been reported on in some detail previously before this Society (6). The results of these tests indicate a slight general increase in saltiness to be taking place. None of the increases have been sufficient as yet to render water unfit for irrigation or spray purposes where

it was safe at the beginning of these tests in 1942.

Nutritional Experiments:

Recognizing the need for citrus nutritional research on the sandy peaty muck soil of the southeastern Everglades area a number of years ago, the Everglades Experiment Station, under the direction of Dr. R. V. Allison, established a series of fertilizer test plots near Davie in 1934. The primary object of these plots was to determine the relative response to phosphate fertilizers, when applied in various amounts and from various sources. Some attention was also given to nitrogen and potash fertilizer levels. There were 16 different treatments included in this experiment. The results obtained from these treatments, up to that time, were discussed by Neller and Forsee (5) at the 1941 Horticultural meeting. Forsee and Neller (2) reported on the response to phosphate treatments secured on these plots at the 1944 meeting.

In a reorganization of citrus work by the Experiment Station, this experiment was transferred to the Citrus Experiment Station for handling early in 1945. Based on statistical analyses of the annual production data from these plots for 9 years, certain major conclusions may now be drawn. Phosphates in relatively normal amounts (an average of 1.08 pounds of P_2O_5 per tree per year for the past 6 years on Valencia trees now 17 years old) gave as good or better results than phosphate treatments in greater or lesser amounts. Trees never receiving direct applications of phosphate fertilizers, but possibly in recent years have secured small amounts of phosphate by cross rooting to adjacent phosphate treated plots, yielded statistically less fruit of inferior qaulity and smaller sizes than did trees receiving normal amounts of phosphate fertilizers. Phosphate at twice the normal amount did not generally yield as well as the normal amounts, although only one treatment was statistically lower. In this latter case a copper relationship evidently was involved. Two of the phosphate treatments at twice the normal amount caused excessive ammoniation for several years in succession. This trouble was practically eliminated in 1 year with a copper spray. The implications of this phosphate: Copper relationship have been discussed by Forsee and Allison (1) and by Jamison (4). There was no significant difference in yields from the various phosphate sources when used in approximately equal amounts with respect to available P_2O_5. These sources were triplesuperphosphate, raw ground phosphate. basic slag, colloidal phosphate, and dicalcium phosphate. A limited amount of evidence was obtained indicating that no statistical increase in yield over zero nitrogen fertilizer was secured through nitrogen fertilizers in amounts ranging each year from 0.36 to 1.44 pounds of N per tree per year for the past 6 years. The trees receiving no nitrogen in the fertilizer probably did secure small amounts of nitrogen from adjacent nitrogen treatments after they became large enough to cross root. Any difference in fruit color was usually in favor of the minus nitrogen treatments. Potash treatments were at the average rates of 2.16, 4.32 and 8.64 pounds of K_2O per tree per year for the past 6 years. There was no statistical difference between any of the potash treatments. In the absence of treatments less than 2.16 pounds one can only speculate on a lower level at which potash would become a controlling factor to reduce yields appreciably. Although not statistically different, the higher potash treatments were rather consistently higher yielding. It appeared that the potash level which probably would have yielded the maximum net cash returns from these trees for this 6-year period was between 2.16 and 4.32 pounds per tree per year.

A point brought out by these experiments which has nothing to do with production but is worth noting, particularly by those concerned with field plot research, is that it was not until the fourth harvest that any statistical difference in yields from the various treatments appeared. This was after the trees had been under experimental treatment for over 6 years. Thus it emphasizes the necessity of allowing ample time for field fertilizer tests with tree crops to "mature" before attempting concusions.

During the past few years there has been a tendency towards an increased use of nitrogen in citrus fertilizers in the Davie section. From the previously discussed nitrogen plots, field observations, soil nitrate nitrogen tests, and the

nitrogen analyses of leaves from these plots, which Dr. Fudge made recently, there is considerable evidence that generally little or no response to nitrogen fertilizers could reasonably be expected with citrus on Davie soils having an organic matter content of about 20% or higher. This would include a large majority of the citrus plantings in that section at present. More conclusive evidence on this point was needed. Consequently in 1944 a rather extensive experiment was established in a 17 year old Valenica grove to further determine the response to nitrogen applied in various amounts and at different seasons on soils ranging in organic matter from about 10% to 60% Last year's harvest data and an estimate of the fruit on these plots recently has shown nothing of significance with respect to either time or amount of nitrogen applied. But as just pointed out, it is hazardous to attempt conclusions for citrus nutritional experiments with only a few years results.

Within the past year or so other experimental plots have been established cooperatively with Mr. Floyd L. Wray and Mr. Walter Stirling in the Davie area. These experiments are designed to test the response of citrus to magnesium, manganese, copper, zinc, and boron. With the exception of the first, all will be tested as sprays as well as fertilizers. Further tests are also being made with N-P-K. None of these have been in progress suffiiciently long to warrant further comment.

Early in this paper it was mentioned that the ratio of exchangeable calcium to other exchangeable bases was frequently found to be unfavorably high in some of the East Coast soils. Dr. B. R. Fudge (3) has just told you something of the evidence of interactions between calcium, magnesium, and potash in the leaves and the relationships and mechanism involved because of the ratio of these elements in the soil. The analyses of soils taken throughout the East Coast citrus belt have shown these unbalanced conditions are likely to exist wherever calcareous material are within a couple of feet of the surface. High exchangeable calcium in relation to the other bases evidently has a suppressing effect on the intake and/or utilization within the plant of the other bases.

A favorable soil ratio of calcium: magnesium for citrus is not greater than 15.1. Bronzing is not yet prevalent in the Davie section, probably partly due to the relatively high native magneisum content of the soil and partly to generally light crops and the predominance of Valencias which have a relatively low magnesium requirement because of their few seeds. Also, most of the groves are comparatively young so cropping out has not become a factor. However, the magnesium content of 13 composite Valencia leaf samples taken west of Davie recently was found to be only about one half that generally considered to be normal for good consistent bearing trees. The trees from which the leaf samples were taken showed no bronzing. The exchangeable magnesium content of the 13 corresponding soil samples taken in conjunction with the leaf samples averaged about 100 pounds per acre 6 inches. This would be considered ample in a soil with calcium in the proper proportion. But the exchangable calcium in these soils averaged approximately

(Continued on Page 21)

Preventive Sprays For Mite Control On Citrus

W. L. THOMPSON
At Meeting Florida State Horticultural Society

The three common species of mites infesting citrus in Florida have been here for many years yet there always seems to be room for improvement in the method of control. Aside from the various insecticides which may be used, several methods or schedules can be followed for mite control. Some groves follow a rather definite or predetermined schedule while others wait until the mites become more or less numerous before control measures are taken. The control of mites has been more effective in the experimental work as well as in commercial operations where a more or less definite schedule has been followed. However, in following a fixed schedule it is necessary that the timing of the individual applications be so arranged that the longest period of control possible is obtained without injury from the mites, regardless of the species. Over a period of years it has been found that sprays of a preventive nature have been more effective in reducing injury than sprays which were applied after the mites had already become abundant.

At present there are no materials on the market which possess a residual toxicity such that they will prevent reinfestation of mites for any prolonged period of time. However, by reducing a very light infestation to an absolute minimum, several months may elapse before large populations develop. The term "preventive spray" is used in this paper to refer to this latter type of situation. The citrus industry as a whole is not run as small units of 5 to 50 acres as it was 20 years ago. Most of the Cooperative Associations now have their own production department, and other groups have been formed either as cooperative or corporations to take care of production. Thus, from 1000 to 8000 acres are under the same supervison and are cared for with the same equipment. Since any one of the individual groups is probably under equipped to spray or dust a large acreage in a short period of time. it is advisable to plan a schedule whereby large acreages can be treated with limited equipment. This must be accomplished in such a manner that mite control can be maintained during the interval between applications.

The following is a discussion of materials which can be used and the timing of the applications to prevent heavy infestations of purple mites, six-spotted mites, and rust mites at the time when they are likely to cause the most severe damage.

The purple mite, **Paratetranychus citri** McG has become a pest of major importance. Purple mites are usually most abundant during the period between November and June. During September, and October it is sometimes difficult to find them, but if a diligent search is made a few mites can be found unless some effective material has recently been applied for their control. If a spray or dust containing a material which is toxic to purple mites is applied during late October, November, or December, the chances are that a purple mite infestation will not develop before spring. The idea of the preventive spray is to reduce a sparce population to such a low level that it will take considerable time for it to build up to even a light infestation. Thus, groves that have been sprayed in October or November with an oil emulsion for scale control are usually not infested with purple mites until March or later. In several groves where checks were made only an occasional mite could be found at the time the spray was applied. The fact that a later infestation did not occur in these groves was not due

THE CEPHALEUROS DISEASE OF CITRUS

(Continued from page 10)

permit. By the next spring the lesions may be an inch in diameter. about the first of June, or whenever the rainy season starts, the new lesions will begin to show the brick red color. This fruiting stage usually continues until about the first of September and will produce spores throughout this time. The alga continues to grow and extends the lesions continuously. After two or three years, several feet of a branch can be completely covered with the alga growth that originated from a single point of infection.

There are other algae that may be found on citrus trees, but these are not parasites. The easiest way to tell the difference between the parasitic alga and the other algae found on the tree is by the brick-red velvety growth that the Cephaleuros alga produces during the rainy season.

There are several factors that influence the prevalence and severity of this algal disease. One of the critical factors in the development of the disease is the amount of rainfall, which has a direct influence on the humidity. In those regions where the rainfall and humidity are high, in those groves that are close planted, and where excessive cover crop is present, the disease is more likely to become serious. A weakened condition of the tree due to water damage, poor nutrition or the presence of other diseases makes the tree more susceptible to attack by alga. The disease is apt to occur on young trees in nursery plantings that have not received proper care.

Figure 4.—Photomicrograph of the fruiting stage of Cephaleuros virescens showing spore production.

Suggested Methods of Control

It is advisable to keep the trees in a vigorous state of growth by the proper use of fertilizers. Dead branches should be pruned out as well as any branches that are severely diseased. The cover crop should be chopped at intervals to keep it from becoming too high. If the trees are planted too close and considerable difficulty is experienced with the disease, it might be advisable to thin out the grove.

In those groves that are regularly sprayed with a copper fungicide the algal disease is not usually found, but sulfur fungicides are not effective for the control of this disease. In addition to the above mentioned cultural practices it is suggested that the following spray schedule wou'd be a clean-up program in those groves where the alga is causing serious damage.

1. Bordeaux mixture 6-6-100 plus two quarts of oil emulsion applied December or January before a flush of growth starts.

(Continued on page 22)

to any residual effect of the oil, but rather because a light infestation (so light that it would not be noticed in a routine check) was reduced to such a low level that the mites could not become abundant until late spring. Early November applications of wettable sulfur and DN1 have given much the same results. During the cool fall and winter months the life cycle of the mites is longer than during warm weather, thus, a reinfestation is slow to develop where the population has been reduced to a minimum by an effective spray in the fall or early winter.

Since purple mites are not very abundant and in many groves are difficult to find in late October or in early November, many growers have not attempted to use control measures at that time of the year. One reason that a light ininfestation may not be noticed in the late fall is due to the fact that most of the mites are on leaves and twigs near the tops of the trees and are not observed when a routine inspection is made. Often, in the fall of the year, no mites can be found on the leaves and twigs which are within reach from the ground. However, at the same time, there may be a modate infestation in the top branches of the trees. Where sulfur sprays are needed for rust mite control in the fall of the year, the addition of some effective miticide such as DN is good insurance against an infestation of purple mites during the winter months. Such programs have been used experimentally and commercially with very good results.

The value of the fall and winter sprays was well demonstrated in the spring of 1946. Where DN or oil was used during November, December, or January, purple mite infestations remained at a low level until after mid-April. However, where control measures were not taken, moderate to heavy infestations were often encountered in groves about the time the spring growth started to flush. Since heavy purple mite infestations did not generally develop until January and February, some growers made no attempt to control the mites in December, and in many cases no DN was added to the dormant nutritional spray. Failure to use some miticide during the fall or in the January nutritional spray resulted in heavy infestations at the time when the new flush of growth had started and the trees were in bloom. DN could not be used because of the danger of injury to young foilage and flower buds. An oil spray could have been used and was used in some cases, but it meant an extra spray since it was too early to use copper for the maximum control of melanose. Such difficulties might have been avoided if control measures had been taken during the dormant season before heavy infestations developed.

The six-spotted mite, **Tetranychus sexmaculatus** Riley is not as common as the purple mite. However, when heavy infestations develop, there is a heavy leaf drop of the new foilage. The same preventive spray schedule used for purple mites has also offered an effective control for the the six-spotted mite. It has been rare that a six-spotted mite infestation would occur in the spring in those groves which received a dormant spray containing either lime-sulfus, DN, or an oil emulsion. In one particular experiment in 1935, part of a grove was sprayed with a dormant copper oil spray. There the six-spotted mite infestation was checked with very little damage to foliage. However, in the unsprayed portion of the grove, a heavy leaf drop resulted from mite injury. There has not been a general infestation of six-spotted mites for six or seven years and the probable reason is that a large percentage of the groves have received a dormant spray containing either lime sulfur, DN, or an oil emulsion. In the spring of 1946

(Continued on page 20)

1. DN— a 40 percent material of Ninitro-o-cyclohexyl phenol.

several heavy infestations of six-spotted mites were reported and in each case no fall or winter spray had been applied.

Since tne rust mite Phyllocoptes pleivorus Ashm, is almost always present, it is just as practical to use preventive sprays for its control as for either purple or six-spotted mites. Many growers have been-reluctant to spray or dust trees with sulfur when no fruit was on them. As reported by Thompson (2) in 1939 and Camp (1), in 1943, it was found that when both a dormant and post bloom spray containing sulfur were applied that the rust mite population was reduced to a very low level. Then the follow-up summer oil spray was able to check the already low mite population to such an extent that further rust mite control measures were unnecessary until late summer, or in some sections until the winter months. In the Vero Beach area where a dormant and a post bloom copper-wettable sulfur spray were applied for the control of scab, melanose, and rust mites, and where these were followed by a summer oil spray, further treatment for rust mites were not required until December. In the Ridge section a somewhat similar program has been used except that zinc replaced copper in the dormant spray. Such a program has maintained low rust mite infestations until July and sometimes until September or October. In general, the dormant sulfur is not an extra spray since the omission of either the dormant or the post-bloom sulfur treatment has invariably necessitated a sulfur application before the summer oil spray. Another reason for the dormant sulfur application is to prevent early rust mite injury on fruit. While it is quite possible that a sulfur spray may not be necessary after August to October on early varieties which are to be picked by December 1, it should be noted that a period of 5 to 8 months elapses between the last sulfur spray in the fall and the time for the post-bloom spray. During that period a very dense population of rust mites usually develops on the leaves and young twigs, and if for some reason the post-bloom spray is delayed, the mites will injure the young fruit. The delay of the post-bloom sprays is sometimes required due to the fact that the spray crews may be used to handle the irrigation equipment during the dry periods which are common during the spring months. Where dormant sulfur applications have been used, rust mite control has been effective until May or later. This affords the grower a wider margin of time in which to apply the post-bloom spray.

There have been indications that a heavy rust mite infestation on the leaves and twigs of the summer and fall growth may be a contributing factor in causing mesophyll collapse during the winter months. Mesophyll collapse has been observed on the tops of trees which were heavily infested with rust mites, but free of purple mites or purple mite injury. It is realized that mesophyll collapse does occur on some trees where neither purple mites or rust mites are present. However, in some groves where there have been spotted infestations of rust mites, those trees which were free of mites showed no mesophyll collapse or leaf drop.

The schedule of the fall and/or dormant sprays plus the post-bloom spray is by no means infallible but during the past 3 to 4 years it has been practiced successfully by a number of production managers who supervise thousands of acres of citrus. At times certain spray applications have not controlled the mites satisfactorily. Although it is not always possible to trace the cause of failure, the lack of thorough coverage is the most common fault. In spite of the fact that thorough coverage is of prime importance for the success of any spray program, many operators are very careless in the application of materials for mite control. It should be understood that purple mites and rust mites infest both the upper and lower surfaces of the leaves, as well as the fruit and young twigs, but that six-spotted mites infest only the under surface of leaves. It must be remembered that purple mites and rust mites are usually most abundant on the tops of the trees during the cool months of the year. Furthermore, all of the materials used to control mites are contact insecticides. Therefore, both surfaces of the leaves should be as completely covered as is economically possible. Sulfur may be a possible exception since it appears to have some fumigation effect against rust mites in warm

(Continued on page 20)

The LYONIZER

Department

COMPILED BY THE LYONS FERTILIZER CO.

Reports Of Our Field Men . . .

NORTH CENTRAL FLORIDA

V. E. (Val) Bourland

The outlook for a fine crop of fruit this fall is better than ever as time goes on and unless some major catastrophe occurs this season will be one of the best this section has ever experienced. Tangerines and Marsh seedless grapefruit look exceptionally good, and the activity among fruit buyers presages a very satisfactory market. Most of the cover crops in this section have been chopped and those not already cared for are being looked after now. As a whole growers in our section are decidedly optimistic over the future outlook for the industry.

POLK COUNTY

J. M. (Jim) Sample

Growers in this section are making prepartions to market their fruit crop, with numerous pre-market sales being reported at good prices. For the most part growers will fare as well or better than they did last season, in spite of a shorter seeded grapefruit crop, since the heavier orange crop will bring up the average. The fall fertilizer application will be earlier this season, with many growers already placing orders and taking delivery now. Due to the summer rains and an early summer fertilization, many groves show the necessity for an increase in Nitrogen this fall. The labor situation seems plentiful now and a great deal of past-due pruning was done this summer. Several new tracts of land are being cleared in preparation for winter planting.

HILLSBOROUGH & PINELLAS COUNTIES

C. S. (Charlie) Little

The growers in this section are in very good shape. We have been having ample rain to keep the groves in tip top shape. Rust mites are still causing a good deal of trouble and nearly all growers are spraying or dusting. Lots of early oranges are now almost as large as they usually are at picking time, and buyers are very active. They are seeking all types of fruit and apparently are looking for a very good early market. Seeded grapefruit is showing up a little better but lacks much of being a normal crop. Valencias in most groves are not as heavy as last year. Many growers are using top dressers on oranges and tangerines in this section in an effort to improve fruit sizts.

SOUTH POLK & HIGHLANDS COUNTIES

R. L. (Bob) Padgett

Now is a good time for growers to make an appraisal of the work which should be completed by this time or finished in the very near future. This is especially true in view of the labor shortage which exists during the picking season. Work which should be done at once includes pruning out dead wood and cutting off water sprouts: removal of all dead wood and fertilizing young trees and trees with heavy crops immediately.

Most of the cover crops in this section are ready to be cut or mowed. Watch and don't let October catch you with a fire hazard around your trees.

There is plenty of Rust Mite but most growers have done an excellent job in its control thus far. We suggest that you don't let them catch you off guard late in the season.

Our fall application of fertilizer will start in this section the latter part of this month and we will be busy for some time to come.

SOUTHWEST FLORIDA

Eaves Allison

The next citrus crop is sizing up nicely over this section and the general grove conditions are well above average. Trees are in good healthy condition and are putting out a large amount of new bearing wood on the summer growth flush. This growth has been enhanced by sufficient rainfall over most of the territory. Many crops have already been sold on the trees at satisfactory prices and buyers are still active. The seeded grapefruit crop is not heavy but is showing up in considerably more volume than was at first expected. Vegetable and flower growers are getting their seed beds and land ready for the fall plantings with present conditions looking favorable for a good season.

WEST CENTRAL FLORIDA

E. A. (Mac) McCartney

Conditions in this territory are very favorable for the coming citrus crop. Fruit is sizing up well and there has been a great deal of new growth. The oil spray application is about finished. Some top dresser is being used on groves with extra heavy crops. The fall fertilizer application will start early as there has been plenty of rain this summer. Vegetable growers did well, having good crops and getting good prices.

Hernando County Agent, H. B. Brinkley and J. A. Creel Soil Conservation Agent for Hernando and Citrus counties, arranged a tour for cattlemen interested in the improvement of pastures, and four ranches were visited in Hernando county and 80 people made the tour including representatives from the Gainesville Experimental Station. Some of the best pasture grass in the state has been developed in this county. Many of those making the trip were unfamiliar with the pasture improvement program and were pleasantly surprised with the progress made. Brinkley and Creel are to be congratulated upon the success of their efforts in this field.

With prospects for a good crop this season we believe growers will find it advantageous to make their Fall application of fertilizer as early as possible in order that trees may carry their present load of fruit in good shape and so that they may be in the strongest possible condition to withstand any possible ravages of pests or weather. Keeping your trees strong and healthy is sound insurance.

ADVERTISEMENT—LYONS FERTILIZER COMPANY

They's still plenty of problems connected with the growin' of citrus crops . . . but in spite of all the cryin' that was done a few years ago about there bein' so many citrus groves that soon there'd be so much fruit nobody would get nuthin' for their crops, the growers seem to be doin' purty well . . . 'course two things helped a lot . . .durin' the war millions of fightin' men got to know how good and how healthful grapefruit and oranges was, who'd never really had a chance to learn before . . . and then the folks who saw how valuable the by-products of citrus fruits was, developed the cannin' and dehydratin' processes to a point where now they could use the big end of the biggest crop we can produce . . . . and the demand for these products has grown so fast that right now, after one of the biggest crops in history they's hardly any canned fruit or juice available . . . just goes to show what a bunch of smart operators can do when they git together and set heir minds on a problem.

Now this year's crop promises to be even bigger than last season's and nobody's worryin' about it, 'cause they know there'll be a ready market fur all the fruit they can produce . . . providin' of course, they produce good quality fruit, and that's just what virtually all the growers in Florida is tryin' to do . . . that same thing accounts for the plans which most growers is makin' today to fertilize their groves early this fall, so that they kin git the most out of this season's crop and keep the trees in the best of shape to fight the pests and weather hazards which are always a problem.

And speakin' of problems this here Lyonizer fertilizer spreader which the Lyons Fertilizer Company is puttin' out is doin' such a bang-up job that growers all over Florida is either buyin' or placing orders for these machines . . . comes as near bein' foolproof as anything you ever seen, and the way it spreads the fertilizer is so accurate that it jist seems that the durn machine was almost human . . . one user told us the other day he wouldn't be a bit suhprised to learn one of these days that the machine could read 'n write.

One thing that we can't help noticin' is how the citrus growers has kept their industry goin' ahead all the time in spite of the fact that other fruit crops seem to have waned in their popularity . . . speaks mighty well both for the folks who is responsible for popularizin' our citrus fruit among the consumers and mighty well, too, for the job Florida growers is doin' in raisin' the finest citrus crops in the world.

Uncle Bill

PREVENTIVE SPRAYS FOR MITE CONTROL ON CITRUS

(Continued from page 17)

weather. However, there can be little if any, fumigation effect during the winter and early spring months when the weather is cool and often windy. Since contact is essential for satisfactory control, the success of any schedule depends upon the coverage of the foliage with the insecticide. It has been observed that some grove operators have the mechanical sprayers moving at a much faster rate when sulfur or sulfur DN sprays are applied than when an oil emulsion is used. If a sufficient amount of material is expected to be deposited on the under surfaces of all leaves, on the tops of the trees, along the sides of the trees not adjacent to the sprayer, and on inside leaves, the rate of the sprayer must be slow enough that there is sufficient air turbulence to turn the leaves. A rate of 1.5 to 1.7 miles per hour is as fast as a sprayer should be driven regardless of the type of head in use. A more thorough coverage was obtained with a Speed Sprayer equipped with a double head and driven slowly than with one equipped with a single head, but driven at a faster rate. The writer had an occasion to inspect the coverage where a neutral copper-wettable sulfur-DN spray was being applied with a Speed Sprayer using a single head. It was evident that the Speed Sprayer was being driven too fast, and when some of the leaves were collected from the top of a tree and examined, it was found that only a trace of the material was on the upper surface of the leaves and none on the under surface. These leaves were heavily infested with rust mites and some purple mites were present. This was true in spite of the fact that it had been less than four weeks since dormant zinc sulfate-wettable sulfur-DN spray had been applied. Thus, poor coverage in that grove had resulted in a heavy infestation of rust mites on the tops of the trees even after two sulfur applications within a period of less than four weeks. In comparison, only an occasional rust mite and very few purple mites were found in another grove three months after the dormant spray which was applied with a Speed Sprayer equipped with a double head, but driven at approximately 1.7 miles per hour.

The coverage obtained with pressure sprayers has been as variable as with the mechanical sprayers where the proper direction of the spray crews has been neglected. The brushing type of application where just the outside of the trees is sprayed is the common method of applying all materials except oil emulsions. On trees over 15 feet in height with rather dense foliage the brushing type of spray has not been as effective as where the spray was driven up through the inside of the trees. For instance, in one grove where there was a heavy infestation of rust mites some trees received a thorough brushing spray of copper-wettable sulfur. Other trees received in addition to the brushing spray, a fast inside spray where the spray gun was operated under the trees for no more than 10 to 15 seconds. Three days after the application, an examination of the leaves was made for the presence of rust mites. On trees receiving the brushing spray only 4 percent of the outside leaves were found to have live mites on them, but 30 percent of the leaves on the inside of the canopy and 40 percent near the trunks were infested. As opposed to this, on trees receiving the brushing spray plus the fast inside coverage, no infested leaves were found either on the outside or on leaves on the inside of the canopy. However, 3 per cent of the leaves near the trunks were still infested. In general, more failures to obtain control have been traced to lack of coverage than to any other cause.

Weather conditions are sometimes responsible for uncertain results. Rain within one to three days after a DN spray appears to reduce the effectiveness of the treatment. The use of improper mixture or improper combinations of materials have been the cause of unsatisfactory mite control. Thompson (3) has reported that where a ratio of 2 to 1 of zinc sulfate to hydrated lime is used in combination with DN, that the control is not as satisfactory as with a ratio of 3 parts of zinc sulfate to 1 of lime. DN is sometimes combined with lime-sulfur. This usually results in poor control when too much lime-sulfur is used, the high pH of the lime-sulfur adversely affects the toxicity of the DN. A dense population of mites at the time of application is also a factor in the length of the period of control. Generally, where there is

Some Sample Schedules for the Prevention of Heavy Infestations of Purple Mites, Six-spotted Mites and Rust Mites During the Fall, Winter and Spring Months.

Periods for Application	Wettable sulfur 10 lbs. DN 10 ozs. or 1% DN-sulfur dust	Wettable sulfur 10 lbs. DN 10 ozs. or 1% DN-sulfur dust	Wettable sulfur 10 lbs. DN 10 ozs. or 1% DN-sulfur dust	Oil emulsion 1.3% oil (Do not use oil spray if weather is dry or cold)
Oct. 15 to Jan. 1				
Jan. 1 to Flush of growth	Zinc sulfate 3 lbs. Hydrated lime 1 lb. Wettable sulfur 10 lbs. DN 10 ozs.	Wettable sulfur 10 lbs. DN 10 ozs. or 1% DN-sulfur dust	Neutral copper 2 lbs. Zinc sulfate 3 lbs. Manganese sulfate 3 lbs Hydrated lime 1½ lbs. Wettable sulfur 10 lbs. DN 10 ozs.	Zinc sulfate 3 lbs. Hydrated lime 1 lb. Wettable sulfur 10 lbs. DN 10 ozs.
Post-bloom Starting 2 weeks after petal fall.	Neutral copper 2 to 3 lbs. Wettable sulfur 10 lbs.	Neutral copper 2 or 3 lbs. Zinc sulfate 3 lbs. Hydrated lime 1 lb. Wettable sulfur 10 lbs.	Neutral copper 2 to 3 lbs. Wettable sulfur 10 lbs.	Neutral copper 2 to 3 lbs. Wettable sulfur 10 lbs.

*Amounts of Materials are on a 100 gallon basis.

Obtain the Spray Schedule of the Better Fruit Program for the complete seasonal schedule.

a heavy infestation of either purple mites or rust mites at the time the insecticide is applied, reinfestation is more rapid than where there is a light infestation at the time of application. One of the reasons for preventive sprays, aside from preventing injury to the trees from either mites or sprays, is to obtain control for the longest possible period with a single operation.

Where effective control of purple mites has been accomplished during the dormant season, it has not been necessary to use control measures after the flush of new growth. Injury to young foliage and fruit has been observed in commercial groves as well as in the experimental plots where DN was applied on young foliage and on fruit where the temperature was above 89°. In 1945, no marked fruit was observed in plots sprayed March 24, April 4, and April 15 with a neutral copper,-DN-wettable sulfur spray, but some fruit was marked in plots sprayed April 24. Normally this would be a period in the year when the maximum temperature would not exceed 80°, but in 1945 the average maximum temperature was 91° between April 24 and April 30. Although all emulsion and copper-oil emulsion sprays have been found safe to spray on young foliage, young fruit sometimes may be injured. In 1944, 14 to 20 percent of the fruit was marked on trees sprayed on April 6, April 20, and May 19. However, in 1945, where the same type of spray was applied during both March and April, practically no marked fruit was observed. However, a copper-oil spray applied on July 17 for melanose control on late bloom fruit marked the early bloom fruit of Hamlins, Pineapples, and Valencias on the same trees where there were only traces of injury to the small late bloom fruit. No injury was observed in adjacent plots where the copper was omitted in the oil spray. It should be noted that as there was no flocculation of the copper or separation of the oil, the materials appeared to be compatible. Seasonal variations of temperature and type of growth are factors limiting the safe use of most materials on the market for purple mite control. The danger of injuring young foliage and fruit during the post-bloom period is an additional reason for mite control during the dormant season. If it is necessary to treat for purple mites when young foliage is present and it is not practical to use an oil spray a 1 percent DN-sulfur dust may be used with a fair degree of safety. It has been demonstrated that a DN-sulfur dust causes much less injury to young foliage than a DN-wettable sulfur spray. However, care should be taken not to apply execessive amounts of the material to any part of a tree.

In conclusion, the use of sprays to control mites during the fall and winter months is recommended in order to prevent heavy infestations from occurring in the spring when considerable injury might result. If the treaments are made during the dormant season, there is little or no danger that the materials used in the sprays would damage either the fruit or foilage. If it is necessary to control purple mites when young foliage is present, either an oil emulsion spray or a DN-sulfur dust may be used.

The following schedules can be used as a guide for the combined control of mites during the fall and winter months. The schedules are the same as recommended in the Better Fruit Program but they are arranged without the alternates except where DN-sulfur dust can be substituted for a DN-wettable sulfur spray. For the complete seasonal program the Spray Schedule of the Better Fruit Program should be consulted.

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With the U. S. Department of Agriculture setting parity on July 15, 1946 at 9.55 cents per pound for peanuts for the 1946 crop and the Commodity Credit Corporation offering both a loan and purchase support program guaranteeing 90 per cent of this price to farmers, Southern peanut growers will realize more for their 1946 crop than ever before in peanut history, according to J. E. Wood, president of the National Peanut Council.

IMPORTANT MEETING SCHEDULED SEPT. 12TH

Florida citrus growers are reminded of a statewide organizational meeting of ETHICAL GROWERS, INC., to be held at the civic center in WINTER HAVEN on Thursday, Sept. 12. At this time the smaller growers of the state—those owning and/or controlling 101 acres or less, will be given an opportunity to band together for the mutual good of the industry. A program including prominent speakers, who will talk on various phases of the Florida citrus industry, its present and future problems, is now beng arranged.

CITRUS RESEARCH ON THE EAST COAST OF FLORIDA

(Continued from Page 13)

3000 pounds per acre 6 inches, which gives a 30:1 ratio. This condition is also evidently manifesting itself in some parts of the Turnbull Hammock section. Magnesium deficiency symptoms have been prevalent in the foliage of many groves in the Hammock for the past several seasons although they are on soils with a relatively high magnesium content. It seems quite likely that in the very near future it will be found profitable from the production standpoint to use considerably more water soluble magnesium in the fertilizers on these soils, as well as on many others high in calcium, than has been uesd in the past. In some severe cases a few applications of fertilizer with 5 or 6% magnesium (MgO) may be warranted until a favorable Ca : Mg ratio is established.

(Concluded next month)

NOTES OF THE TRADE

(Continued from Page 6)

films as a container or wrapper, packaging in small lots of nearly all kinds of fruits and vegetables.

NEW ALUMINUM PIPE PLANT

Lightweight aluminum pipe for irrigation of Florida citrus groves and truck farms has been started at Winter Haven, with about 3,000 running feet being produced daily in a new plant established by Race and Race, Inc. Using a specially engineered metal, the pipe, weighing much less than the conventional galvanized pipe, is being made in all standard diameters.

CITRUS HOUSING PROJECT UNDERWAY

One of the state's biggest and most comprehensive employee housing and welfare programs has been started at Davenport by Holly Hill Fruit Products Inc., which is spending $300,000 to provide housing, hospital facilities and child care for its employees.

Forty two-bedroom houses, each on a 60 to 100 foot lot, modernly equipped, are now under construction. Residential clubs for upwards of 100 white women employees are planned along with a dormitory for negro men. Each will have dining facilities where meals will be served at cost to employees.

A completely equipped and well-staffed hospital is now being set up and a resident doctor will be in charge along with nurses.

THE CEPHALEUROS DISEASE OF CITRUS

(Continued from Page 15)

2. Bordeaux mixture 4-4-100 plus two quarts of oil emulsion applied just before the rainy season starts or as soon as the red stage of the alga is first observed.

3. Bordeaux mixture 4-4-100 plus two quarts of oil emulsion one month after the second application. In the second and third applications a neutral copper at equal copper concentrations may be substituted for the Bordeaux mixture. The usual additions of insecticides can be made to the above mixture as needed but if sulfur is added, omit the oil. If the alga is present in the grove, but does not appear to be causing injury, it is suggested that the application of the second and third sprays listed in the schedule may be sufficient to give effective control. In spraying for the control of this disease the spray should be directed so as to thoroughly cover the bark of all the twigs and branches.

After the disease has been brought under control by the clean-up program, the use each year, of a copper spray for melanose should also give satisfactory control of the alga if the twigs and branches are thoroughly sprayed.

CLASSIFIED Advertisements

The rate for advertisements of this nature is only five cents per word for each insertion. You may count the number of words you have, multiply it by five, and you will have the cost of the advertisement for one insertion. Multiply this by the total number of insertions desired and you will have the total cost. This rate is so low that we cannot charge classified accounts, and would, therefore, appreciate a remittance with order. No advertisement accepted for less than 50 cents.

BIG CITRUS GROVE FOR SALE, heavy producer, several varieties oranges and grapefruit, well located near railroad siding, fertile soil, good frost protection. Reasonably priced. For sale by Charlton & Associates, Valuation Engineers and Realty Appraisers, Ft. Lauderdale, Fla.

CITRUS TREES—Best quality usual varities on sour orange or rough lemon stock. Robt. P. Thornton, c/o Clay Hill Nurseries Co., Box 2880, Tampa, Florida.

COMPLETE Packing House equipment for sale. Two car load capacity. N. E. McConaghy, Satsuma, Alabama.

FOR SALE—One Farquhar high pressure sprayer. This machine has been mounted on a 1½ ton truck, has large wooden tank, high pressure Fairbank-Morse pump, driven by a 20 HP Noro engine. Has been used a very few hours. —R. C. Carlisle, Sneads, Florida.

FOR SALE BY RETIRING OWNER—20 Acre, 14 year old citrus grove of Valencia and Temple oranges and Marsh Seedless grapefruit. Located on paved road in the heart of the famous Indian River citrus section. Has excellent drainage and good artesian well. Average returns for past two years $9000.00. Purchase price $1500.00 per acre. For further particulars communicate with owner, Alfred Warren, Route 1, Box 212 Vero Beach, Florida. Phone 4662.

WANTED TO BUY — REAL ESTATE — My wife and I desire ten (10) acres or more citrus grove plus additional acreage and home or homesite. Immediate possession not required. Furnish full particulars. Cash or mortgage as you desire. N. W. Oppenheim 155 Humes Place, Memphis 11, Tenn.